

CENTRAL ARIZONA PROJECT FISH MONITORING

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**SUMMARY OF SAMPLE YEAR 2000 FISH SURVEYS IN BEHALF OF A
LONG-TERM MONITORING PLAN FOR FISH POPULATIONS IN
SELECTED WATERS OF THE GILA RIVER BASIN, ARIZONA**

Submitted in partial fulfillment of
U.S. Bureau of Reclamation
Agreement Number 01-FC-32-0150

Submitted to

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July 30, 2004

This report summarizes fish sampling by Arizona Game and Fish Department (AZGFD), Arizona State University (ASU) and U.S. Bureau of Reclamation (USBR) in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year (SY) 2000 (period September 5, 2000 to January 8, 2001). Protocols implemented during this monitoring are detailed by Clarkson 1996 a-c.

Waters (stations) sampled during this monitoring were (1) San Pedro River (SanP) downstream from the U.S. and Mexico international boundary, (2) Gila River between Coolidge Dam and Ashurst-Hayden Diversion, (3) Salt River between Stewart Mountain Dam and Granite Reef Diversion, (4) Central Arizona Project (CAP) Canal at selected pump plants, (5) Salt River Project (SRP) Arizona (North) Canal (SRPn), (6) SRP South Canal (SRPs), and (7) Florence-Casa Grande (FCG) Canal (Table 1).

Comparisons are not made herein with monitoring data acquired during prior years as reported by Clarkson (1998) and Marsh (1999, 2004), or to earlier years (e.g., Marsh and Minckley 1982, Mueller 1996). The reader is referred to those documents for comparisons with prior years.

MONITORING OVERVIEW

A total of 27 taxa (excluding undetermined and hybrid *Lepomis* and a catostomid hybrid, but including undifferentiated cichlids) was captured during SY 2000 monitoring. Seven were taken in San Pedro River, eight in FCG Canal, 11 in CAP Canal, 13 in Gila River, 16 in SRPn, 17 in SRPs, and 19 were in Salt River (Table 2). Four native species (15% of total taxa), exclusive of a catostomid hybrid, were collected: roundtail chub, longfin dace, Sonora sucker, and desert sucker. All four were in Salt River, none was in CAP Canal, and one-to-three natives were encountered in other waters. The remaining 23 taxa were non-native, which among stations numbered between four (San Pedro River) and 15 (Salt River). Natives comprised 13 to 29% of all species among stations, except in the CAP Canal where there were none.

Black buffalo (Catostomidae: *Ictiobus niger*) is reported for the first time from a CAP monitoring program station. A single specimen was taken from above the electrical fish barrier on the SRP North (Arizona) Canal during SY 2000. The fish was tentatively identified in the field, and photographed, but was not retained as a voucher. The species was introduced to the Salt River in 1918 along with bigmouth buffalo *I. cyprinellus* and smallmouth buffalo *I. bubalis* (Minckley 1973), and members of the genus still occur in reservoirs upstream from the Salt River Project canal system.

Total number of fish varied widely among stations (Table 3), a reflection of differences in sampling effort and gear type as well as fish abundance. Canal samples were not strictly comparable since those from SRPn, SRPs, and FCG were opportunistic and qualitative (except for samples above the electrical fish barriers on the SRP canals, which represented near-complete censuses). Native fishes overall accounted for 5.5% of 14,831 individuals captured at all Gila River basin stations during the sample year (Table 3). Proportion that native fishes comprised of total catch ranged from 0 (CAP Canal) to 77.1% (San Pedro

River). Gila and Salt rivers were 0.3 and 53.2% natives, respectively. SRPn, SRPs and FCG canal samples were 4.8, 1.7 and 0% natives above the electric fish barriers, respectively, and 44.8, 33.3 and 0.1% natives below those structures (Table 3).

Community structure differed substantially among stations (Table 3). Native longfin dace was the most abundant species in combined samples from the San Pedro River (followed by mosquitofish), and native Sonora sucker predominated the Salt River catch (followed by native desert sucker). Red shiner was the predominant species in samples from the Gila River (followed by green sunfish). Undetermined or hybrid *Lepomis* and bluegill were the most abundant fishes in the CAP Canal, channel catfish and flathead catfish predominated in SRPn, undifferentiated cichlids (mostly young of year) were most abundant in SRPs, followed distantly by channel catfish, and mosquitofish and red shiner were the most abundant species in FCG (Table 3).

SAN PEDRO RIVER

Sampling Notes and Deviations from Protocol – Sampling was performed between 25 and 28 September 2000 (Table 1). Names and locations of several stations are changed from Clarkson 1996 a and c; these are noted in the table. Eight of nine stations were sampled: station 1-2-3 (Gage Station) was not sampled. Backpack electrofishing used at all sites and tote-barge mounted electrofishing was also used at station 1-3-3 (Mouth).

Species Richness and Distribution -- Seven species were captured in the San Pedro River (Tables 4 and 5A). No new species were detected. Six were taken in the upper reach, one in the middle, and three in the lower. Two natives were encountered (longfin dace and desert sucker), comprising one-third of total species. Longfin dace found at six of eight stations and had the broadest representation among native species, and desert sucker was at two stations, both in the upper reach.

Four non-natives were in the upper reach, none in the middle, and two in the lower. Fathead minnow, green sunfish, and black bullhead were only in the upper reach, mosquitofish was in upper and lower reaches, and yellow bullhead was only found in the lower reach.

Assemblage Structure – Natives outnumbered non-natives overall (77.1% of a total catch of 376 individuals), and at all reaches (Tables 3 and 5A). Native longfin dace was the most abundant fish species overall (69% of total numbers), and at all reaches (Table 5A). Desert sucker comprised slightly more than 5% of the overall catch. Sonora sucker was not encountered.

Mosquitofish was the most abundant non-native and the second-most abundant species overall, making up 20% of the catch. Fathead minnow, green sunfish, black bullhead, and yellow bullhead each contributed less than 1% to the total.

GILA RIVER

Sampling Notes and Deviations from Protocol – Sampling was performed between 26 October and 22 November 2000 (Table 1). Names and locations of several stations are changed from Clarkson 1996 a and c; these are noted in the table. Eleven of 12 stations were sampled; station 2-1-2 (Hawk Spring Canyon) was not sampled. Hawk Spring Canyon is inaccessible and has been deleted from the monitoring program. Backpack electro-fishing was used at all sites, augmented by a variety of gears including dip nets, boat-mounted electrofisher, tote-barge mounted electrofisher, seines, and trammel nets.

Species Richness and Distribution – Thirteen species (excluding undetermined and hybrid *Lepomis*) were captured in the Gila River (Tables 4 and 5B). No new species were detected. Eleven were taken in the two upper reaches, four in the third reach, and seven in the lower. Two natives were encountered, longfin dace and Sonora sucker, comprising about one-sixth of total species. Sonora suckers were found at five stations in the two upper reaches, while longfin dace was only in the second reach.

Ten non-native species were in the upper reach, nine were in the upper-middle, four were taken from the lower-middle reach, and five were found in the lowermost reach. Red shiner, green sunfish, channel catfish, and mosquitofish were the most widely distributed non-native species, each being found at eight, nine or 10 sites among all four reaches. Carp, yellow bullhead, channel catfish, and flathead catfish were absent from reach 3; largemouth bass from reaches 3 and 4; threadfin shad from reaches 2 and 3; bluegill from reach 4; and undetermined or hybrid *Lepomis* plus black crappie were not found in reaches 2 to 4. Carp, bluegill, and yellow bullhead were taken at 5 sites; largemouth bass, flathead catfish, and threadfin shad at 4; and undetermined or hybrid *Lepomis* plus black crappie were at one site only.

Assemblage Structure –The two native species combined comprised less than 0.3 percent of total catch of 7,186 individuals from the Gila River (Table 3). Longfin dace was represented by a single specimen from reach 2, and Sonora sucker was less than 1% of catches from reaches 1 and 2. Neither native fish was abundant at any site; indeed, longfin dace is characterized as rare and Sonora sucker as uncommon.

Non-native red shiner was by far the most abundant species overall (78% of total catch) and predominated in reach 2 (followed by green sunfish) and reach 3 (followed by mosquitofish). It was the second most abundant fish in reaches 1 and 4, where mosquitofish and green sunfish, respectively, were predominant. Carp, largemouth bass and bluegill were relatively common in reach 1, channel catfish in reaches 1 and 2, and yellow bullhead and flathead catfish in reach 2. Other non-native fishes each contributed less than 0.5% to total catch and were considered uncommon or rare.

SALT RIVER

Sampling Notes and Deviations from Protocol – Sampling was performed between 11

November and 06 December 2000 (Table 1). All three stations were sampled. A variety of techniques including backpack electrofishing, boat-mounted electrofishing, and trammel netting were used to collect fishes.

Species Richness and Distribution – Nineteen fish species (excluding a hybrid sucker but including undetermined cichlids) were taken from the Salt River. No new species were detected. Ten were at the upper, 16 at the middle, and 10 at the lower station (Table 4). Four (21%) species were native (roundtail chub, longfin dace, desert sucker, and Sonora sucker) and 15 were non-native. Only desert sucker and undetermined cichlids were at all sites; most other common species were at two stations, while uncommon and rare ones were at only one station (Table 5C).

Assemblage Structure -- Native fishes comprised 53.2% of the total Salt River catch of 605 individuals (Tables 3 and 5C). Sonora sucker was the most abundant species overall (40%) and at the two lower stations. Desert sucker was the most abundant species at the upper site and contributed 13% of total numbers, while roundtail chub (two individuals) and longfin dace (three individuals) were rare. A single specimen of a hybrid sucker (*Catostomus insignis* x *Pantosteus clarki*) was captured at the upper site.

Largemouth bass was the second most abundant species overall (12% of total catch) and the most abundant fish at the lower station. Channel catfish was the second most abundant fish at the upper station. Undetermined cichlids were common in the middle reach. Other non-native fishes each contributed less than about 5% to total numbers. Three redear sunfish and three threadfin shad were captured; rainbow trout and yellow bass each were represented by an individual; all were considered rare.

CENTRAL ARIZONA PROJECT CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed upstream from Phoenix between 05 and 07 September 2000, and downstream from Phoenix between 18 and 21 December 2000 (Table 1). All stations were sampled. A variety of gears were consistently applied at the several stations (angling, boat-mounted electrofishing, hoop netting, trammel netting, minnow trapping, and trot lining), with exception of Station 4-4-1 (Bouse) where angling and trot lining were not used.

Species Richness and Distribution – Eleven taxa (exclusive of undetermined or hybrid *Lepomis*), all non-native, were captured from the CAP Canal. No new species were detected. Nine were in the upper, six in the middle, and ten from the lower reach (Tables 4 and 5D). Grass carp, carp, red shiner, largemouth bass, and threadfin shad were taken from all three reaches. No species was found at all stations, although grass carp were at 6 of 7 stations.

Assemblage Structure – Centrarchids were predominant in the sample of 593 individuals from the CAP Canal (Table 5D). Undetermined or hybrid *Lepomis* was the most abundant overall (44% of total numbers), followed by bluegill (23%), red shiner (11%), and carp (6%). Other species, grass carp, largemouth bass, green sunfish, redear sunfish, black bullhead,

channel catfish, threadfin shad, and striped bass each contributed less than 5% to the total.

Red shiner was the predominant fish in the upper reach, followed closely by undetermined or hybrid *Lepomis* and then bluegill (Table 5D). Carp was the most abundant species in the one-station middle reach, where other species were rare, but only 24 total fish were captured there. Undetermined or hybrid *Lepomis* predominated in the lower reach, although it occurred only at San Xavier (station 4-3-3). Carp predominated at Brady (station 4-3-1) and redear sunfish was the most abundant species at Red Rock (station 4-3-2), but total catch was small at both sites.

SRP NORTH (ARIZONA) CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed on 07 and 08 January 2001 (Table 1). Three stations were sampled during routine monitoring: one above the electrical fish barrier, one immediately (0.2 km) below the barrier, and one in the reach extending from Indian Bend Wash (km 14.7) upstream to the 101-Pima freeway overpass. The above barrier site was sampled with a bag seine after partial drainage, and the other two samples were accomplished using a boat-mounted electrofisher.

Species Richness and Distribution – Sixteen species, excluding a hybrid sucker but including undetermined (primarily young of year) cichlids, were captured from the SRPn Canal (Tables 2 and 4). No new species were detected. Three native species were encountered. The canal was subdivided for into two reaches: “above” (one station) and “below” (two stations) the electrical fish barrier (Tables 5E), although these reaches were not designated in the monitoring protocol (Clarkson 1996a). A dozen species were taken above the electric fish barrier and 14 were collected from downstream canal reaches. Red shiner, green sunfish, and yellow bass, plus a hybrid sucker were encountered below but not above the barrier, while roundtail chub, black buffalo, and flathead catfish were taken above but not below. The black buffalo represents a new record for a CAP monitoring program station (see above).

Below the fish barrier, nine species (two native) were taken from the upper station, and 10 (two native), plus a hybrid sucker, were from the lower (Table 4). Grass carp, red shiner, desert sucker, Sonora sucker, largemouth bass, and undetermined cichlids were distributed among both stations; carp, channel catfish, and rainbow trout were only at the upper station; and a sucker hybrid, bluegill, green sunfish, and yellow bass were found only at the lower station.

Assemblage Structure – Native fishes collectively comprised 14.1% of the total number of 538 individuals taken from the SRPn Canal (Table 3). Desert sucker comprised 3%, Sonora sucker 11%, and roundtail chub 0.2% of the overall catch. Relative abundances of the two native suckers almost certainly were gross underestimates, as collectors tend to capture sub-samples of up to a few hundred individuals rather than all of the obviously large aggregations that are encountered throughout the canal.

Non-native channel catfish and flathead catfish were the most abundant species overall (respectively 50% and 18% of total numbers), followed by Sonora sucker, red shiner (4%), and grass carp (3%), largemouth bass (3%), bluegill (2%), and undetermined cichlids (2%). Other species each contributed at less than 1% to the total numbers.

Ictalurid catfishes were overwhelmingly predominant above the electric fish barrier (67% of total fishes) but uncommon (1%) below (Table 5E). Next in close order came Sonora sucker, grass carp, and undetermined cichlids. All other species were uncommon-to-rare.

Below the fish barrier, red shiner was predominant in the upper reach, and Sonora sucker was the most abundant fish in the lower reach.

SRP SOUTH CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed on 27 November 2000 (Table 1). Five stations were sampled during routine monitoring; one above the electrical fish barrier and four downstream at River Road Siphon (2.5 km below the barrier), Roosevelt Water Conservation District turnout (RWCD; 4.0 km), “Demossing Station” (5.8 km), and Triple Junction (9.0 km) where the South Canal ends. The above barrier site was sampled with a bag seine after partial drainage, River Road Siphon was sampled with gill nets, and the other three samples were accomplished using dip nets. Locked gates across canal roadways caused delays and inconveniences, but these were minor.

Species Richness and Distribution – Seventeen species, including undetermined (primarily young of year) *Tilapia* and three natives, were captured from the SRPs Canal (Tables 2 and 4). No new species were detected. The canal was subdivided into two reaches: “above barrier” (one station), and a downstream, below barrier reach with four stations (Tables 4 and 5F) although these latter reaches were not designated in the monitoring protocol (Clarkson 1996a). Ten species were taken above the electric fish barrier and 14 were from collective downstream canal stations. Goldfish, carp, bluegill, green sunfish, threadfin shad, yellow bass, and striped bass were encountered below but not above the barrier, while carp, black crappie, and walleye were taken above but not below.

Below the fish barrier, four species were at the upper, seven at the upper-middle, 13 at the lower-middle, and seven at the lower station. Native desert sucker was at all stations, Sonora sucker was at 3 of 4, and roundtail chub was at 2 of 4. Only largemouth bass among non-native fishes was encountered at all stations.

Assemblage Structure – Native fishes comprised 2.7% of the total catch of 4,135 individuals from SRPs Canal (Table 3). Sonora sucker was the third most abundant species (Table 5F), but contributed only 1.3% to the total, while desert sucker comprised 0.3% and roundtail chub added 1.1%. As in the SRPn canal (above), relative abundances of the two native suckers likely were underestimated.

Non-native undetermined cichlids were the most abundant fishes overall (Tables 3 and 5F),

accounting for 90.5% of total catch, and followed among non-natives by channel catfish (4.1%), flathead catfish (0.8%), and red shiner (0.6%). Other non-native fishes each contributed less than 0.5% to the total catch.

Undetermined cichlids, primarily young of year, were overwhelmingly predominant (93%) above the electric fish barrier but were uncommon (3.7%) below (Table 5F). Next in order of abundance came channel catfish, Sonora sucker, flathead catfish, desert sucker, carp, roundtail chub, and largemouth bass. Black crappie and walleye were represented single specimens.

Below the fish barrier, native desert sucker was predominant at the upper station, non-native red shiner was the most abundant fish at the upper-middle station and lowermost stations, and threadfin shad was predominant at the lower-middle station (Table 5F). Channel catfish was the second most abundant species at the lower station.

FLORENCE-CASA GRANDE CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed on 04 October 2000 (Table 1). Five stations were sampled during routine monitoring: one immediately below the canal headworks at Ashurst-Hayden Diversion Dam (above the electrical fish barrier located at China Wash), and four downstream at below China Wash barrier (2.6 km downstream from the diversion dam), turnout at 14.5 km, Pima Lateral (15.2 km) and Pima Lateral Turnout (15.3 km). The above barrier site was sampled with seines and dip nets after partial drainage, below China Wash and Pima Lateral were sampled with seines, and the two turnouts were sampled with a backpack electrofisher. Lapses in communication between San Carlos Irrigation District (SCID) and ASU/BR resulted in confusion regarding timing of changes in canal operations, however, this did not compromise monitoring.

Species Richness and Distribution – Eight species including one native were taken from the Florence-Casa Grande Canal (Tables 2 and 4). No new species were detected. Native longfin dace and non-native yellow bullhead were found only below the electric fish barrier at China Wash, while bluegill and threadfin shad occurred only above the barrier. Other fishes, all non-natives, were found both above and below the barrier. The FCG Canal was the only artificial stream (canal) in which longfin dace was encountered.

Assemblage Structure – Native species were represented only by a single longfin dace, which comprised about 0.1% of total number of 1,362 individuals from the FCG Canal (Table 3). With this exception the entire catch was non-native fishes.

Among non-natives, mosquitofish was the predominant species above (67%) and below (82%) the electrical fish barrier, at each sample station, and overall (Table 5G, 78% of catch). Next in abundance were channel catfish (11%), red shiner (9%) and carp (2%). Threadfin shad was represented by two individuals, and bluegill and yellow bullhead by one specimen each.

RECOMMENDATIONS

Continue to work toward improved communication between canal operators (SRP, SCID) and those performing fish monitoring activities so that sampling can coincide closely with scheduled outages.

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TABLE 1. Station, date, gear type, and lead entity for sampling activities conducted in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, for sample year 2000 (period September 5, 2000 to January 8, 2001). Stations are identified by 3-digit numeric codes that respectively indicate stream name, reach name, (1-up to 4-down-stream), and station name (1-3 for upper, middle, and lower) (see Clarkson 1996 a-c). Where station location and name have changed from Clarkson 1996 a-c, the corrected (new) name is given. Dates are given as month (01-12) day (01-31) and year (00 or 01). Abbreviations as follow: Stations: SRP = Salt River Project, FCG = Florence-Casa Grande Canal, and CAP = Central Arizona Project Canal; Gears: A = angling, Bp = backpack electrofisher, d = dip net, Ef = boat-mounted electrofisher, Tb = tote-barge mounted electrofisher, G = gill net, H = hoop net, M = minnow trap, S = seine, T = trammel net, and TI = trot line; and Lead: AZGFD = Arizona Game and Fish Department, ASU = Arizona State University, and BR = U.S. Bureau of Reclamation. CAP stations all are associated with pumping plants, which are named for each station, while FCG and SRP stations are given as approximate miles downstream from canal origin and/or a verbal location description.

Station	Date	Gear	Lead
San Pedro River			
1-1-1 Hereford	09 25 00	Bp	AZGFD
1-1-2 Lewis Springs	09 25 00	Bp	AZGFD
1-1-3 Charleston	09 26 00	Bp	AZGFD
1-2-1 Hughes Ranch	09 26 00	Bp	AZGFD
1-2-2 Soza Ranch	09 27 00	Bp	AZGFD
1-3-1 Aravaipa Creek	09 27 00	Bp	AZGFD
1-3-2 Swingle Wash	09 28 00	Bp	AZGFD
1-3-3 Mouth	09 28 00	Bp, Tb	AZGFD
Gila River			
2-1-1 Coolidge Dam	10 26 20	Bp, d, Ef, S, T	AZGFD
2-1-3 Hook & Line Ranch	10 27 00	Bp, T	AZGFD
2-2-1 Dripping Springs Wash	10 30 00	Bp, S	AZGFD
2-2-2 Christmas	10 30 00	Bp	AZGFD
2-2-3 O'Carrol Canyon	10 31 00	Bp, S, T	AZGFD
2-3-1 San Pedro River	11 17 00	Bp, S	AZGFD
2-3-2 Kearny	11 16 00	Bp, S	AZGFD
2-3-3 Kelvin	11 16 00	Bp, S	AZGFD
2-4-1 A-Diamond Ranch	11 22 00	d, Ef, S	AZGFD
2-4-2 Cochran	11 15 00	Bp, S	AZGFD
2-4-3 Box-O Wash	11 15 00	Bp, Tb	AZGFD

Table 1. Concluded.

Station		Date	Gear	Lead
Salt River				
3-1-1	Stewart Mountain Dam	12 01 00	Bp, T	AZGFD
3-1-2	Blue Point RS	12 06 00	Bp, Ef, T	AZGFD
3-1-3	Granite Reef Dam	11 29 00	Ef, T	AZGFD
CAP Pumping Plants				
4-1-1	Bouse	09 05 00	Ef, H, M, T	BR
4-1-2	Little Harquahala	09 06 00	A, Ef, H, M, T, TI	BR
4-1-3	Hassayampa	09 07 00	A, Ef, H, M, T, TI	BR
4-2-1	Salt-Gila	12 18 00	A, Ef, H, M, T, TI	BR
4-3-1	Brady	12 19 00	A, Ef, H, M, T, TI	BR
4-3-2	Red Rock	12 20 00	A, Ef, H, M, T, TI	BR
4-3-3	San Xavier	12 21 00	A, Ef, H, M, T, TI	BR
SRP South Canal				
5	0.0 Above fish barrier	11 27 00	S	AZGFD
	2.5 River Road siphon	11 27 00	G	ASU
	4.0 RWCD turnout	11 27 00	d	ASU
	5.8 Demossing Station	11 27 00	d	ASU
	9.0 Triple Junction	11 27 00	d	ASU
SRP North (Arizona) Canal				
6	0.0 Above fish barrier	01 08 01	S	ASU
	0.2 Below fish barrier	01 08 01	Ef	ASU
	14.7 Indian Bend Wash	01 07 01	Ef	ASU
Florence-Casa Grande Canal				
7	0.0 Below diversion dam	10 04 00	S, d	ASU
	2.6 below China Wash	10 04 00	S	ASU
	14.5 turnout	10 04 00	Bp	ASU
	15.2 Pima Lateral	10 04 00	S	ASU
	15.3 Pima Lateral turnout	10 04 00	Bp	ASU

TABLE 2. Common names and four letter codes for fish species captured during sampling activities conducted in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2000 (period September 5, 2000 to January 8, 2001). Native fishes indicated by asterisks. Abbreviations as in Clarkson 1996 a.

Species		SanP	Gila	Salt	CAP	SRPn	SRPs	FCG	All sites
*Roundtail chub	GIRO	0	0	X	0	X	X	0	X
Fathead minnow	PIPR	X	0	0	0	0	0	0	X
Goldfish	CAAU	0	0	0	0	0	X	0	X
*Longfin dace	AGCH	X	X	X	0	0	0	X	X
Grass carp	CTID	0	0	0	X	X	0	0	X
Carp	CYCA	0	X	X	X	X	X	X	X
Red shiner	CYLU	0	X	X	X	X	X	X	X
*Sonora sucker	CAIN	0	x	X	0	X	X	0	X
*Desert sucker	PACL	X	0	X	0	X	X	0	X
Sucker hybrid	CLIN	0	0	X	0	X	0	0	X
Black buffalo	ICNI	0	0	0	0	X	0	0	X
Largemouth bass	MISA	0	X	X	X	X	X	0	X
Bluegill	LEMA	0	X	X	X	X	X	X	X
Green sunfish	LECY	X	X	X	X	X	X	0	X
Redear sunfish	LEMI	0	0	X	X	0	0	0	X
Undetermined or hybrid sunfish	LEPO	0	X	0	X	0	0	0	X
Black crappie	PONI	0	X	0	0	0	X	0	X
Black bullhead	AMME	X	0	0	X	0	0	0	X
Yellow bullhead	AMNA	X	X	X	0	0	0	X	X
Channel catfish	ICPU	0	X	X	X	X	X	X	X
Flathead catfish	PYOL	0	X	X	0	X	X	0	X
Mosquitofish	GAAF	X	X	X	0	0	0	X	X
Sailfin molly	POLA	0	0	X	0	0	0	0	X
Rainbow trout	ONMY	0	0	X	0	X	0	0	X
Walleye	STVI (SAVI)	0	0	0	0	0	X	0	X
Threadfin shad	DOPE	0	X	X	X	X	X	X	X
Undetermined Cichlid	TILA	0	0	x	0	X	X	0	X
Yellow bass	MOMI	0	0	X	0	X	X	0	X
Striped bass	MOSA	0	0	0	X	0	X	0	X

TABLE 2. Concluded.

Total species (taxa)	7	13	19	11	16	17	8	27
Native	2	2	4	0	3	3	1	4
Non-native	5	11	15	11	13	14	7	23
Percent native	29	18	21	0	19	18	13	15

Notes:

This individual was tentatively identified in the field as black buffalo (Catostomidae: *Ictiobus niger*). The specimen was photographed but not retained as a voucher

Undetermined or hybrid sunfish may include juveniles of all species of *Lepomis* plus juvenile and adult individuals that represent crosses among the several species of *Lepomis*, which are known to hybridize freely.

The scientific name for Walleye has recently been revised from *Stizostedion vitreum* to *Sander vitreus* (Nelson et al. 2004). The species code should be updated to reflect this update (i.e., from STVI to SAVI).

Undetermined Cichlids likely includes juvenile and adult Mozambique tilapia, *Tilapia (Oreochromis) mossambica*, and blue tilapia *Tilapia (Oreochromis) aurea* and their hybrids, plus juvenile Redbelly (Zill's) tilapia, *Tilapia zilli*.

Total species (taxa) includes undetermined Cichlids, but excludes hybrid suckers and undetermined or hybrid sunfishes, which are assumed to be subsumed into the individual parental species.

TABLE 3. Total numbers of fishes captured during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2000 (period September 5, 2000 to January 8, 2001). Native fishes indicated by asterisks. Abbreviations as in Clarkson (1996 a). Ab and Bb respectively indicate Above and Below electrical fish barriers on SRPn, SRPs and FCG canals.

Species	SanP	Gila	Salt	CAP	SRPn		SRPs		FCG		Total
					Ab	Bb	Ab	Bb	Ab	Bb	
*Roundtail chub			2		1		11	2			16
Fathead minnow	2										2
Goldfish								1			1
*Longfin dace	258	1	3							1	263
Grass carp				21	7	14					42
Carp		70	14	37	5	1	13		13	8	161
Red shiner		5580	11	68		24		26	20	103	5832
*Sonora sucker		19	239		15	46	39	14			372
*Desert sucker	32		78		4	10	17	29			170
Sucker hybrid			1			1					2
Black buffalo					1						1
Largemouth bass		65	75	7	7	8	10	11			183
Bluegill		103	16	134	1	8		6	1		269
Green sunfish	3	616	11	16		2		2			650
Redear sunfish			3	12							15
Undet or hybrid sunfish		15		258							273
Black crappie		1					1				2
Black bullhead	5			1							6
Yellow bullhead	1	31	20							1	53
Channel catfish		107	60	9	264	4	145	24	92	64	769
Flathead catfish		87	5		99		27	5			223
Mosquitofish	75	437	8						262	795	1577
Sailfin molly			5								5
Rainbow trout			1		2	2					5
Walleye							1				1
Threadfin shad		54	3	26		1		7	2		93
Undet Cichlid			49		7	2	3754	5			3817
Yellow bass			1			2		2			5
Striped bass				4				1			5
Total	376	7186	605	593	413	125	4018	135	390	972	14813
Total native	290	20	322	0	20	56	67	45	0	1	821
Total nonnative	86	7166	283	593	393	69	3951	90	390	971	13992
Percent native	77.1	0.3	53.2	0.0	4.8	44.8	1.7	33.3	0.0	0.1	5.5

TABLE 4. Fish species richness determined by sampling in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year (SY) 2000 (period September 5, 2000 to January 8, 2001). Species counts include undetermined Cichlids but exclude undetermined plus hybrid *Lepomis* and a hybrid sucker (see notes accompanying Table 1). Stations are identified by 2-digit numeric codes that respectively indicate reach name, (1-up to 4-down-stream), and station name (1-3 for upper, middle, and lower) (see Clarkson 1996 a-c). Distances between stations and reaches are relative. Totals for each reach (and for all reaches) followed by number of native and non-native (n/nn) species; ns indicates station not sampled during SY 2000; dash (--) indicates the designated reach or station does not exist on that stream/canal. Reaches along SRPn, SRPs, and FGC canals are artificial; canal reaches 1 are above respective electrical fish barriers and reaches 2, 3, and 4 are below. Abbreviations as in text; see also Clarkson (1996 a-c).

Reach/Station	SanP	Gila	Salt	CAP	SRPn	SRPs	FCG
1-1	4	8	10	5	12	10	6
1-2	2	ns	16	7	--	--	--
1-3	6	11	10	7	--	--	--
Total	6	11	19	9	12	10	6
n/nn	2/4	1/10	4/15	0/9	3/9	3/7	0/6
2-1	1	8	--	6	9	4	5
2-2	1	8	--	--	10	7	4
2-3	ns	8	--	--	--	13	5
2-4	--	0	--	--	--	7	0
Total	1	11	--	6	14	14	8
n/nn	1/0	2/9	--	0/6	2/12	3/11	1/7
3-1	1	3	--	4	--	--	--
3-2	3	3	--	6	--	--	--
3-3	0	3	--	5	--	--	--
Total	3	4	--	10	--	--	--
n/nn	1/2	0/4	--	0/10	--	--	--
4-1	--	6	--	--	--	--	--
4-2	--	6	--	--	--	--	--
4-3	--	5	--	--	--	--	--
Total	--	7	--	--	--	--	--
n/nn	--	0/5	--	--	--	--	--
All reaches	7	13	19	11	16	17	8
n/nn	2/5	2/11	4/15	0/11	3/13	3/14	1/7
percent native	29	15	21	0	19	18	13

TABLE 5A. Fish catch at San Pedro River stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2000 (period September 5, 2000 to January 8, 2001). Fish species listed alphabetically using standard abbreviations per Clarkson (1996), data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; subtotals and total number are for each age class.

	PIPR AGCH		PACL		LECY		AMME		AMNA		GAAF
			0	1	0	1	0	1	0	1	
1-1-1	0	5	0	0	1	0	0	1	0	0	39
1-1-2	0	0	0	2	0	0	0	1	0	0	20
1-1-3	2	45	20	10	0	2	2	1	0	0	8
subtotal	2	50	20	12	1	2	2	3	0	0	67
1-2-1	0	124	0	0	0	0	0	0	0	0	0
1-2-2	0	64	0	0	0	0	0	0	0	0	0
subtotal	0	188	0	0	0	0	0	0	0	0	0
1-3-1	0	14	0	0	0	0	0	0	0	0	0
1-3-2	0	6	0	0	0	0	0	0	1	0	8
1-3-3	0	0	0	0	0	0	0	0	0	0	0
subtotal	0	20	0	0	0	0	0	0	1	0	8
Total	2	258	20	12	1	2	2	3	1	0	75

TABLE 5B. Fish catch at Gila River stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2000 (period September 5, 2000 to January 8, 2001). Fish species listed alphabetically using standard abbreviations per Clarkson (1996); data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; subtotals and total number are for each age class.

	AGCH		CYCA		CYLU		CAIN		MISA		LEMA		LECY		LEPO		PONI		AMNA		ICPU		PYOL		GAAF DOPE	
	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
2-1-1	0	0	11	5	0	0	36	4	1	0	35	10	0	0	0	0	0	0	1	3	1	1	157	0		
2-1-3	0	0	36	245	0	6	12	6	22	67	15	238	15	0	0	1	0	0	15	5	0	2	114	1		
Subtotal	0	0	47	250	0	6	48	10	23	67	0	248	15	0	0	1	0	0	16	8	1	3	271	1		
2-2-1	1	0	0	3999	0	6	6	0	12	0	61	26	0	0	0	0	2	8	4	11	0	0	0	0		
2-2-2	0	0	10	320	0	6	0	1	0	0	0	0	0	0	0	0	1	2	10	7	42	40	16	0		
2-2-3	0	0	4	789	0	1	0	0	0	0	138	7	0	0	0	0	8	8	16	5	1	0	74	0		
Subtotal	1	0	14	5108	0	13	6	1	12	0	199	33	0	0	0	0	11	18	30	23	43	40	90	0		
2-3-1	0	0	0	15	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	8	0		
2-3-2	0	0	0	21	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	40	0		
2-3-3	0	0	0	65	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0		
Subtotal	0	0	0	101	0	0	0	0	1	0	4	2	0	0	0	0	0	0	0	0	0	0	55	0		
2-4-1	0	0	9	0	0	0	0	0	0	0	9	0	0	0	0	0	0	1	3	17	0	0	6	27		
2-4-2	0	0	0	76	0	0	0	0	0	0	76	0	0	0	0	0	0	1	6	2	0	0	5	14		
2-4-3	0	0	0	45	0	0	0	0	0	0	45	0	0	0	0	0	0	0	2	0	0	0	10	12		
Subtotal	0	0	9	121	0	0	0	0	0	0	130	0	0	0	0	0	0	2	11	19	0	0	21	53		
Total number	1	0	70	5580	0	19	54	11	36	67	333	283	15	0	0	1	11	20	57	50	44	43	437	54		

TABLE 5C. Fish catch at Salt River stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2000 (period September 5, 2000 to January 8, 2001). Fish species listed alphabetically using standard abbreviations per Clarkson (1996), data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; total number is for each age class.

	GIRO		AGCH	CYCA		CYLU	CAIN		PACL		CLIN		MISA		LEMA		LECY		LEMI		AMNA		ICPU		PYOL		GAAF POLA		ONMY		DOPE TILA		MOMI	
	0	1		0	1		0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1			0	1			0	1
3-1-1	0	1	0	0	0	0	0	18	1	56	0	1	0	0	2	4	3	7	0	1	6	4	29	27	0	0	0	0	0	1	0	15	0	0
3-1-2	0	0	3	0	5	10	0	178	3	18	0	0	18	19	0	3	0	1	0	2	0	10	0	4	0	3	8	5	0	0	2	32	0	0
3-1-3	0	1	0	0	9	1	0	43	0	0	0	0	12	26	0	7	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	2	1	0
Total number	0	2	3	0	14	11	0	239	4	74	0	1	30	45	2	14	3	8	0	3	6	14	29	31	0	5	8	5	0	1	3	49	1	0

TABLE 5D. Fish catch at Central Arizona Project (CAP) canal stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2000 (period September 5, 2000 to January 8, 2001). Fish species listed alphabetically using standard abbreviations per Clarkson (1996); data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; subtotals and total number are for each age class.

	CTID		CYCA		CYLU	MISA		LEMA		LECY		LEMI		LEPO		AMME		ICPU		DOPE		MOSA	
	0	1	0	1		0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
4-1-1	0	0	0	0	0	1	0	19	1	7	0	0	0	43	0	0	0	1	0	6	0	0	0
4-1-2	0	3	0	0	8	0	0	27	0	2	0	0	0	10	0	0	0	0	2	3	0	0	1
4-1-3	0	4	0	16	50	0	2	0	0	0	0	0	0	1	0	0	0	0	4	2	12	0	0
Subtotal	0	7	0	16	58	1	2	46	1	9	0	0	0	54	0	0	0	1	6	11	12	0	1
4-2-1	0	6	0	9	4	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0
4-3-1	0	4	0	9	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
4-3-2	0	2	0	3	0	3	0	0	2	0	0	0	7	0	0	0	0	0	0	0	0	3	0
4-3-3	0	2	0	0	0	0	0	0	85	6	1	1	4	17	187	0	1	0	0	0	0	0	0
Subtotal	0	8	0	12	6	3	0	0	87	6	1	1	11	17	187	0	1	0	0	0	1	3	0
Total	0	21	0	37	68	4	3	46	88	15	1	1	11	71	187	0	1	1	8	11	15	3	1

TABLE 5E. Fish catch at Salt River Project (SRP) North (Arizona) Canal stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2000 (period September 5, 2000 to January 8, 2001). Fish species listed alphabetically using standard abbreviations per Clarkson (1996), data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; total number is for each age class. See Table 1 for sampling dates.

	GIRO		CTID		CYCA		CYLU	ICNI		CAIN		PACL		CLIN		MISA		LEMA		LECY		ICPU		PYOL		ONMY		DOPE	TILA	MOMI	
	0	1	0	1	0	1		0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1			0	1
Above barrier	0	1	0	7	0	5	0	0	1	1	14	0	4	0	0	1	6	1	0	0	0	232	32	0	99	0	2	0	7	0	0
0.2 below dam	0	0	0	5	0	1	19	0	0	0	7	0	4	0	0	0	2	0	0	0	0	1	3	0	0	0	2	0	1	0	0
14.7 below dam	0	0	0	9	0	0	5	0	0	0	39	0	6	0	1	4	2	8	0	1	1	0	0	0	0	0	0	1	1	2	0
subtotal below	0	0	0	14	0	1	24	0	0	0	46	0	10	0	1	4	4	8	0	1	1	1	3	0	0	0	2	1	2	2	0
Total	0	1	0	21	0	6	24	0	1	1	60	0	14	0	1	5	10	9	0	1	1	233	35	0	99	0	4	1	9	2	0

TABLE 5F. Fish catch at Salt River Project (SRP) South Canal stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2000 (period September 5, 2000 to January 8, 2001). Fish species listed alphabetically using standard abbreviations per Clarkson (1996), data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; total number is for each age class. See Table 1 for sampling dates.

	CAAU		GIRO		CYCA		CYLU	CAIN		PACL		MISA		LEMA		LECY		PONI		ICPU		PYOL		SAVI		DOPE	TILA		MOMI		MOSA	
	0	1	0	1	0	1		0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1		0	1	0	1	0	1
Above barrier	0	0	0	11	0	13	0	26	13	8	9	5	5	0	0	0	0	1	0	68	77	5	22	0	1	0	129	3625	0	0	0	0
2.5 below dam	0	0	0	1	0	0	0	0	9	0	24	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.0 below dam	0	0	0	0	0	0	4	0	0	0	2	1	0	0	0	2	0	0	0	2	0	1	0	0	0	0	2	0	0	0	0	0
5.8 below dam	0	1	0	1	0	0	2	0	1	0	1	1	7	1	5	0	0	0	0	2	4	0	1	0	0	7	0	2	0	2	0	1
9.0 below dam	0	0	0	0	0	0	20	0	4	0	2	1	0	0	0	0	0	0	0	14	2	3	0	0	0	0	1	0	0	0	0	0
subtotal below	0	1	0	2	0	0	26	0	14	0	29	3	8	1	5	2	0	0	0	18	6	4	1	0	0	7	3	2	0	2	0	1
Total	0	1	0	13	0	13	26	26	27	8	38	8	13	1	5	2	0	1	0	86	83	9	23	0	1	7	132	3627	0	2	0	1

TABLE 5G. Fish catch at Florence-Casa Grande canal stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2000 (period September 5, 2000 to January 8, 2001). Fish species listed alphabetically using standard abbreviations per Clarkson (1996), data are total number of fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; total number is for each age class. See Table 1 for sampling dates.

	AGCH	CYCA		CYLU	LEMA		AMNA		ICPU		GAAF	DOPE
		0	1		0	1	0	1	0	1		
Above barrier	0	11	2	20	1	0	0	0	89	3	262	2
2.6 below dam	0	6	0	48	0	0	0	1	11	9	225	0
14.5 below dam	0	1	0	1	0	0	0	0	10	0	10	0
15.2 below dam	1	1	0	54	0	0	0	0	2	32	560	0
15.3 below dam	0	0	0	0	0	0	0	0	0	0	0	0
subtotal below	1	8	0	103	0	0	0	1	23	41	795	0
Total number	1	19	2	123	1	0	0	1	112	44	1057	2